Self-Test 1: 4.10-5.2

1. Antidifferentiate. Unless specified, find the most general antiderivative.

   (a) $f(x) = 3\sqrt{x} - \frac{1}{\sqrt{x}}$

   (b) $f(x) = x^2 + x^{-1}$

   (c) $g'(x) = \frac{4}{\sqrt{1-x^2}}$, $g(1/2) = 1$

2. The following questions refer to $f(x) = x - 1$, $2 \le x \le 4$

   (a) Find the exact area under the curve using geometry.

   (b) Estimate the area under the curve using 4 rectangles and right endpoints and equally spaced subintervals.

   (c) Write the exact area as a limit, using right endpoints and equally spaced subintervals.

   (d) Write the exact area as a limit, using left endpoints and equally spaced subintervals.

   (e) Find the area under the curve by computing the limit that you wrote down in part (c).

3. Express the following limit as a definite integral:

$$\lim_{n \to \infty} \sum_{i=1}^{n} \sqrt{2 + \frac{5i}{n}} \cdot \frac{5}{n}$$

4. Express the following integral as a limit, using right endpoints and equally spaced intervals:

$$\int_{1}^{4} \sin(x) \, dx$$

5. Find the value of the sum:

$$\sum_{k=1}^{n} (3k + 5)$$